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ABSTRACT

Changes in the perception of figural aftereffects occurring during adulthood were investigated with 56 female subjects. A significant linear trend analysis indicated that the magnitude of the figural aftereffects increased very slightly with age. This was supported by a significant T value which suggested a difference between the two extreme age groups--20 and 70--and a chi square which also supported the difference between the 20-year olds and the rest of the group. (Author)

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Figural Aftereffects in Adulthood*

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It was postulated that a change in the perception of figural aftereffects would occur during adulthood. A significant linear trend analysis (p .001) indicated that the magnitude of the figural aftereffects increased very slightly with age. This was supported by a significant t value (p .05) which suggested a difference between the two extreme age groups: 20 and 70. A chi square (X^2=3.85, p .05) also supported the difference between the 20 year olds and the rest of the group.

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This study was designed to illustrate adult development of the figural aftereffect (FAE) by observing its magnitude from the third through the eighth decade of life. The specific type of aftereffect under study was the Köhler effect which involves a change in the apparent size of a figure. There were three possible outcomes which could have been obtained by investigating the magnitude of the FAE from young adulthood through old age.

First; with increasing age, stimulus persistence could increase to the point where it would produce an afterimage-like effect. The trace left by the inspection figure could be superimposed on the test figure, and the two would be seen simultaneously. Rather than the expected repulsion effect an attraction effect would occur and produce an initial decrease in the FAE magnitude in middle age.

Secondly; the temporal gap of the interstimulus interval might not be bridged by stimulus persistence. It may serve to make the temporal comparison more vivid and therefore would increase the magnitude of the FAE with age. Thirdly; stimulus persistence may have no effect, or it may compensate for an age-related increase in the difficulty of integrating information across time. This would produce a levelling off of FAE magnitude.

Subjects. The subjects were 56 females in each of six age groups. The groups ranged in age from 20 to 29; 30 to 39; 40 to 49; 50 to 59; 60 to 69; and 70 to 79. All subjects had at least 20/30 corrected or uncorrected vision as determined by the Master Orthorater. Due to the spectral composition of the lighting in the tachistoscope (Scientific Prototype Model GB) subjects who wore tinted contacts were excluded.

Procedure. Stimuli consisted of an inspection figure (IF) and a test figure (TF) which were paired with several comparison figures (CF). The IF included a solid black disc of 4 mm. in diameter and a black circle of 11 mm. in diameter and .5 mm. thick (see Fig. 1). The nine CFs were black circles varying in outer diameter (see Fig. 2). They ranged from 8.5 mm. in diameter increasing in increments of .5 mm. up to 12.5 mm. in diameter. The TF was a circle 9.5 mm. in outer diameter. Each CF was paired with the TF for presentation and they were placed symmetrically on either side of the inspection dot. The centers of the CFs and TFs were approximately 2.25 mm. from the inspection dot. They both were positioned so they were concentric with the IF. The expected figural aftereffect was an enlargement of the TF which circumscribed the disc.

The maximum horizontal visual angle subtended was 2^{o}. Reflected illumination was set at 6.5 apparent foot candles as measured with a Macbeth Illuminometer.

Before the experimental condition was begun, each subject viewed two trials of at least six presentations of TF-CF combinations to obtain baseline control data. The stimuli were presented in this and the experimental condition according to the rules of Piaget's converging method of limits. In the experimental condition the IF was exposed for 30 seconds in channel one of the tachistoscope. After a 500 millisecond interstimulus interval, the TF and CF appeared in channel two for one second. During the ISI the fixation point was present in the background channel. Subjects were required to tell the experimenter which circle appeared larger: the TF or CF. No equals judgements were permitted. There was a 45 second rest interval between each exposure of IF and TF. This interval served to bring the subject back to baseline so that subsequent judgements would not be influenced by the previous exposures. The experimental condition consisted of four trials of at least six presentations of the IF followed by the TF and CF. Two additional control trials were run after the experimental series.

Each subject participated in two sessions of this kind on two seperate occasions. In the first session the TF always appeared on the left side and circumscribed the solid black disc. In the second session the sides were reversed. The TF appeared on the right and still circumscribed the disc. Subjects were run at approximately the same time of day for the two sessions.

Results. After the data was collected, the point of subjective equality (PSE) was assessed for each series of trials. This point appeared as a change in the subject's judgement concerning the size of the TF relative to the size of the CF in the ascending or descending trials. The mean PSE for the control and experimental conditions was calculated. The mean PSE for the control condition was subtracted from the mean PSE for the experimental condition to determine the magnitude of the aftereffect. Since each subject participated in two sessions, these calculations yielded two measures of aftereffect magnitude. These were then averaged together to yield one measure of FAE magnitude per subject.

The average magnitude of aftereffect for each age group was calculated and plotted (see Fig. 3). There appears to be a slight increase in FAE magnitude with increasing age. A trend analysis indicated overwhelming linearity ($F=1274.97$, $p<.001$). Based upon this linear trend a post hoc one-tailed t test between the extremes (ages 20 and 70) was carried out yielding a significant difference ($t=1.93$, $p<.05$). Reordering the data about the grand median in terms of frequency indicated as well a difference between the 20 year olds and the rest of the group ($X^2=3.85$, $p<.05$). Inspection of the graph reveals that these differences lie in the occurrence of a smaller FAE magnitude for the 20's as compared to the other age groups.

Discussion. There has been little previous age-related research on figural aftereffects. A study by Pollack (1960) tested the magnitude of FAE in subjects ranging in age from four to 73 years. With a fixation time of ten seconds, Pollack found a decline in FAE magnitude from four years to the nine-ten age group. Following this decline there was a rapid increase in magnitude of the aftereffect which asymptoted at the 18-24 years age group. Another study by Eisdorfer and Axelrod (1964) concluded that older subjects (age 60 to 70) have a smaller magnitude of visual aftereffect than younger subjects. The present study is more consistent with Pollack's findings. One of the main differences between the two is that Pollack's top age group was 24 and over, while the present study divided subjects into decades so each group could be analyzed seperately. In doing so it was found that the magnitude of FAE increased very slightly with age. A significant linear trend, t test and a X^2 revealed some significant differences. The increase in magnitude was very small on the whole but the graph indicated the continuation of a slight increase.

These results are in agreement with a study by Lorden, Atkeson and Pollack (in press). They investigated magnitude change of the Usmadze effect during adulthood. Their results are also plotted on the graph (Fig. 3). Their fixation time for the inspection figure was 500 milliseconds so their study could

be considered a short exposure version of the FAE study. Both sets of data, as shown on the graph, indicate little change in the magnitude of the effect. Perhaps the increased exposure time of the IF in the present study accounts for the increased magnitude in all age groups. The absence of a significant decline or a sharp rise in the magnitude of the effect in either set of data may suggest that contrast phenomena employing circular stimuli do not produce stimulus persistence effects strong enough to support either a reversal of illusion direction or a marked increase in illusion magnitude.

Since a slight increase in aftereffect magnitude has been found, it is apparent that the figural aftereffect in this case works as a typical contrast phenomenon. The occurrence of a contrast phenomenon depends on the integration of information through time. This capacity increases through youth into young adulthood before asymptoting. The effects of stimulus persistence must be massive to interfere with the temporal integration of circular stimulus figures at least. By contrast, a study by Atkeson (1978) on magnitude differences in the successive Mueller-Lyer illusion reports the actual reversal of the illusion in the 60 year old age group. This finding is attributed to the apparent simultaneity of the information successively presented. It suggests that figures with angles may persist longer than circles.

The results obtained in this study were consistent highly with the third expectation cited at the beginning of this report. The prolongued exposure of the IF increased the contrast effect for all age levels as compared with the Lorden, Atkeson and Pollack (in press). There was no evidence suggesting that stimulus persistence could fill the 500 millisecond interstimulus interval. No differential stimulus persistence effects were apparent in any age group.

A more direct test of stimulus persistence effects would be achieved by using the inspection figure as its own test figure, thus eliminating contrast effects. Such a study is planned for the near future.

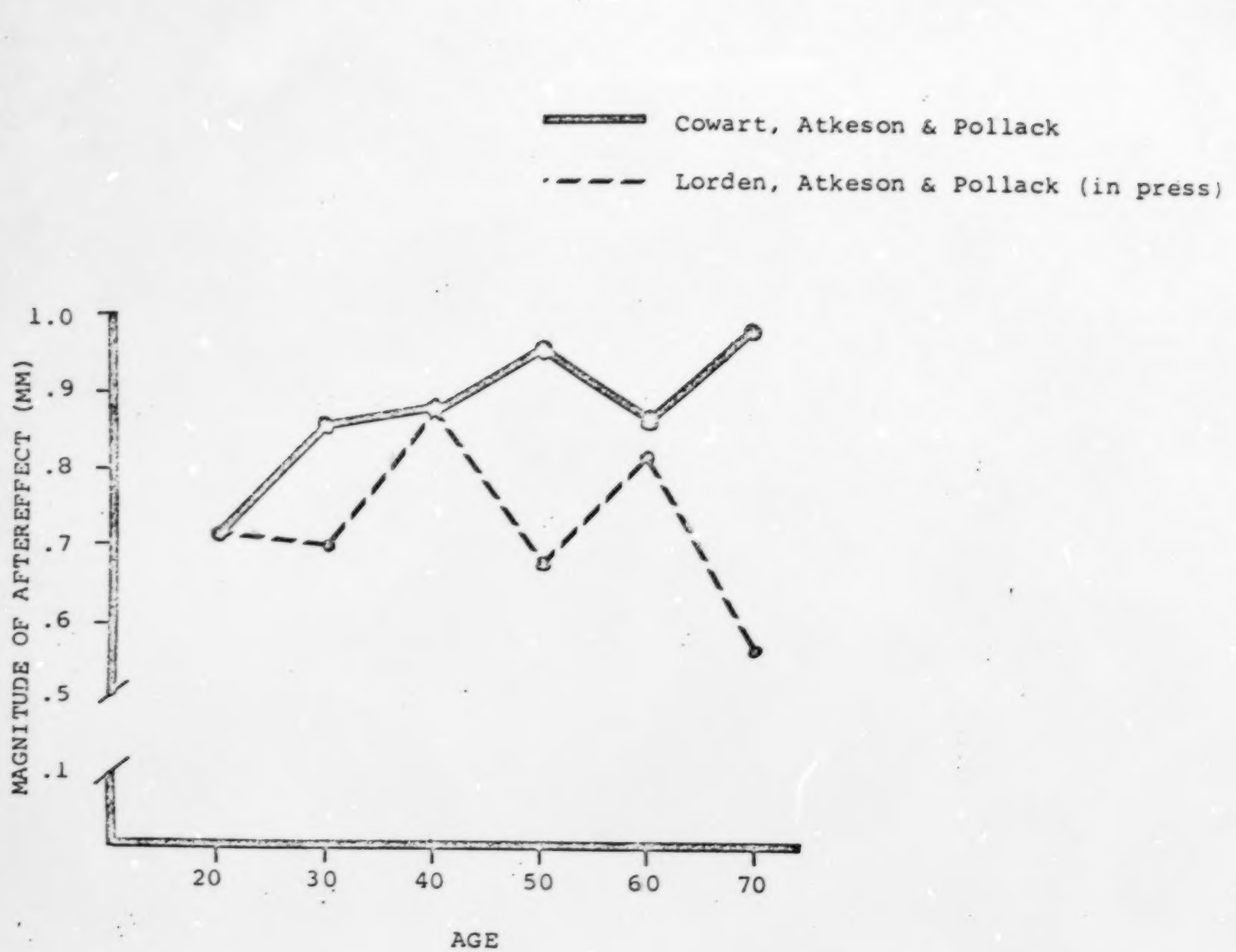
References

Atkeson, B. M. Differences in the magnitude of the simultaneous and successive Mueller-Lyer illusions from age twenty to seventy-nine years. Experimental Aging Research, 1978, 4, 55-66.

Eisdorfer, C. & Axelrod, S. Senescence and figural aftereffects in two modalities: A correction. Journal of Genetic Psychology, 1964, 104, 193-197.

Lorden, R., Atkeson, B. M. & Pollack, R. H. Changes in illusion magnitude from young adulthood to old age. Journal of Gerontology, 1979, in press.

Pollack, R. H. Figural after-effects as a function of age. Acta Psychologica, 1960, 17, 417-423.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Lorden, Atkeson & Pollack (in press)
MAGNITUDE OF AFTEREFFECT (MM)
1.0
.9
.8
.7
.6
.5
.1
20
30
40
50
60
70
AGE

Fig. 1 Inspection figure (IF)

Fig. 2 Test figure (TF) and

Comparison figure (CF)